MINDFULNESS AND SUPPRESSION AS EMOTION REGULATION STRATEGIES

by

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Honors Thesis

Appalachian State University

Submitted to The Honors College

in partial fulfillment of the requirements for the degree of

Bachelor of Arts

May, 2015

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Abstract

This study examines what effect mindfulness has on anxiety and memory levels in comparison to a suppression and control group. Participants underwent natural, suppression, and mindful conditions while being shown a series of positive and negative images and rating how happy/unhappy (valence) they felt and how excited/calm (arousal). After answering a series of questionnaires, participants were tested on their recall levels. The results revealed that arousal and valence ratings of the pictures were not significantly different across conditions, and neither was the recall of the participants. The results of this experiment do not align with previous research and may be due to a few limitations within the study. Therefore, more studies will need to be conducted and further research will need to be completed.

Mindfulness and Suppression as Emotion Regulation Strategies

It is part of our human nature to up-regulate or down-regulate our positive or negative emotions when we find them hard to deal with (Gross, 2013). Emotion regulation involves altering the emotions that one experiences, when they experience them, and how they experience them (Gross, 2013). According to the process model of emotion regulation (Gross, 2013), there are five strategies and five places in which a person can regulate their emotions: situation selection, situation modification, attentional deployment, cognitive change, and response modulation (Gross, 2013). Emotion regulation techniques such as mindfulness and suppression fall under the category of "response modulation," which involves influencing the "experiential, behavioral, or physiological" aspects of the response to emotion, and regulating emotional behavior (Gross, 2013). What effects do the mindfulness and suppression emotion regulation strategies have on anxiety and memory?

Suppression

Suppression is the inhibition of a negative or positive emotional reaction (Gross, 2013). Suppression reduces the expression of behavior, but creates arousal and doesn't reduce how intensely one experiences an emotion (Campbell-Sills, Ellard, & Barlow, 2014). People who suppress their emotional experiences tend to feel less positive emotions and more negative emotions (Campbell-Sills, Ellard, & Barlow, 2014). Using suppression habitually is correlated with lower levels of well being and higher levels of negative affect and anxiety disorders (Campbell-Sills, Ellard, & Barlow, 2014).

Previous research also reveals that suppression leads to impaired memory (Richards & Gross, 2000). In this study, participants viewed a film clip that would bring out a negative emotion. Half of the participants were told to suppress their emotions, while the other half

were not given instructions. After watching the film clip, they rated the extent to which they experienced a negative emotion. Participants were then tested on auditory and visual details of the film afterwards by answering 24 detailed questions on the film. Results showed that the suppression group had impaired memory on the recall task. In a second study, participants looked at high or low arousal emotional images with instructions to watch, suppress, or reappraise their emotions. Participants viewed a spectrum of a set of 9 slides of images of people in accidents, some not as bad, and others very bad, and were given verbal information about the person. After a distractor task, they were given a recognition and recall test of the slides and information. Results again showed that participants who suppressed emotions had poorer memory for verbal information (Richards & Gross, 2000).

An additional study also revealed that suppression of emotional images leads to reduced memory in young adults. In Emery & Hess's (2011) study, they determined that the reduced memory is a result of the attention being taken away from the stimulus and directed to controlling the behavior (Emery & Hess, 2011). In contrast, older adults in the study showed no impaired memory. In the study, participants were shown blocks of positive and negative pictures under 3 different viewing instructions: suppress their emotional reaction, enhance their emotional reaction, or show a natural emotion regulation. Then they rated emotional valence and how they felt after viewing the group of images, and were given a surprise recall test to compare recall from each condition. Suppression reduced memory levels in young adults, and also caused young adults to feel unhappier after viewing positive images. Emotional valence of the stimuli didn't have an effect on age differences of expressive regulation (Emery & Hess, 2011).

Mindfulness

According to Linehan, mindfulness is "learning to observe internal and external events without necessarily trying to terminate them when painful or prolong them when pleasant…" (as cited in Salmon, Sephton, Weissbecker, Hoover, Ulmer & Studts, 435). Mindfulness involves concentrated attention and acceptance on the present moment in a non-judgmental way, whether the event is positive or negative (Arch, 2006). An observation of current feelings and behavior while remaining aware of the way they connect to each other is an essential aspect to mindfulness (Salmon et al., 2004). Rooted in Buddhist philosophy, mindfulness is a way to live with the suffering that everyone experiences—worrying about the past and future decreases the quality of life. Mindfulness in Western psychology is a way to reduce the distress that comes with life (Salmon, et al., 2004). The intention of mindfulness is to be self-aware and accepting, in which one is open to self-observation (Salmon et al., 2004).

According to Salmon et al. (2004), there are 4 components to mindfulness, as observed in clinically-based exercises. The first is the regulation of attention, which begins with an observation of breath. Through practice of observation of breath, one can begin mindful observation of other aspects of life, such as any sounds they hear, or any thoughts they may have. The goal is to "detach" from thoughts (Salmon et al., 2004). The second component is nonjudgmental awareness. This means observing any events or thoughts as they are happening in present awareness as neutral, and accepting them without giving one any more meaning than the next. Whenever any form of judgmental thought comes into our minds, this brings us out of the present moment, and therefore it is important to allow those thoughts to pass. The third concept is physiological hypoarousal. Hypoarousal contrasts with daily living levels of arousal, and involves a slowed metabolism, reduced amounts of

energy, and a greater relaxed awareness. The fourth concept is present-moment focus. Careful attention to each moment and experience as it passes is incredibly important. The goal of mindfulness is to learn how to find acceptance in something that cannot be changed (Salmon, et al., 2004).

Previous research shows that mindfulness-based breathing inductions can reduce negative emotional experiences. Researchers Arch & Craske (2006) recruited participants with no experience in mindfulness and had them view positive, negative, and neutral images. They were then assigned to one of three groups, and went through three separate periods of measurement—time 1 before the induction, and times 2 and 3 were taken after the induction. At each time, participants viewed the slides of images, and then an Affect Scale was completed to rate their emotional level. After time 1, some then underwent a 15-minute mindfulness induction of focused breathing, in which they were given mindfulness-based instructions while viewing images. Others underwent a 15-minute constant worry session, and a control group served as the final group, in which participants were told to think about whatever comes to mind for 15 minutes (Arch & Craske, 2006). Participants then viewed the images again at time 2 and 3, and after time 3, participants viewed the most negatively rated pictures and were told that they could stop when they wanted—the researchers just wanted to know how many slides the participants viewed. The results showed that the mindful group rated the neutral images more positive before and after the inductions than the worry or control groups, who rated the neutral images as more negative after the induction. Results also showed that significantly more people in the mindful group chose to view all 25 negative slides than the worry group—they showed greater ability not to become overwhelmed by the slides. Also, the results showed that the mindful group reported the

most stability in emotions across all the slides. This shows that mindfulness reduced negative affect in people who have never used mindfulness before (Arch & Craske, 2006).

Previous research also shows that long-term mindfulness trainings can reduce negative affect and effect memory as well. Results of Goldin & Gross's (2010) study on the MBSR program, a mindfulness-based stress reduction (MBSR) program—which combines elements of mindfulness with breathing, body-scans, and yoga—participants who participated in the group showed decreased levels of depression, rumination, anxiety, and had increased self-esteem levels (Goldin & Gross, 2010). In Jha, Stanley, Kiyongaga, Womg, & Gelfand's (2010) study, the effects of a mindfulness training (MT) was examined to determine if it could be used as a prevention mechanism for military service members who are about to be deployed. Two pre-deployment U.S. Marine groups were used for the study—one group was given MT training and the other group was not. Participants underwent mindfulness-based mind fitness training—an 8-week instruction session with weekly 2 hour meetings. Results showed that working memory was stable over time, but it was lowered in the control group. In the MT group, of those who practiced MT often, working memory increased in long-term mindfulness trainings, and in those who practiced it little, it decreased. Those who practiced MT more often also had lower negative affect (Jha et al., 2010).

In an additional study, researchers in Lalot, Delplanque, and Sanders (2014) study examined the effects of mindfulness while regulating positive emotions. Forty-five individuals watched four positive video clips and were placed into one of four conditions: mindfulness, reappraisal, suppression, or no strategy/control. Video clips were rated on valence (negative or positive) and arousal (calm or exciting). The participant's facial

expressions were also recorded during the video clips to determine how effectively they were engaging in the condition. The results revealed that there were lower levels of positive affect in the reappraisal and mindful conditions when compared to suppression and control conditions, and that facial expressions varied. Since the "full attention" aspect of mindfulness requires acceptance and non-judgment, researchers believed that mindfulness would decrease positive feelings as well (Lalot, Delplanque, & Sanders, 2014). This shows that mindfulness is a great technique for effective emotion regulation, since it has the ability to up-regulate and down-regulate both positive and negative emotions.

Anxiety

Anxiety is a spectrum, beginning with a fear reaction to help stay away from danger, and ending with panic and an avoidance of people and places to enhance feelings of safety (Greeson & Brantley, 2009). According to Goldstein (1976), mindfulness is a great method for helping anxiety where it is noticed and responded to with acceptance, thereby decreasing tolerance, stopping avoidant behaviors, and promoting self-awareness. By focusing on the experience of anxiety, rather than what the individual thinks about anxiety, they gain a better understanding about anxiety and their relation to it (as cited in Greeson & Brantley, 2009).

Emotion regulation strategies have been examined in relation to clinical anxiety disorders, to provide a glimpse into how these strategies would affect general anxiety that we all experience at non-clinically significant levels. Emotions that are common of anxiety disorders are extremely excessive, cause distress, and involve tragic thoughts, uncomfortable feelings, extreme sensitivity to threats, and avoidance (Campbell-Sills, Ellard, & Barlow, 2014). Engaging with the anxiety-producing event leads to more effective emotion regulation than avoidance. Often though, people with anxiety disorders find it difficult to

regulate emotions properly. According to previous research, avoidance, rumination, and suppression showed a positive correlation to anxiety and depression (Campbell-Sills, Ellard, & Barlow, 2014). Sometimes, anxious individuals may end up selecting negative strategies such as suppression more often, or good strategies such as mindfulness less often than those who are not anxious. Or, those who are anxious may find it harder to apply and engage in emotion regulation strategies (Campbell-Sills, Ellard, & Barlow, 2014).

Previous research shows that mindfulness is an adaptive strategy for people with anxiety disorders because it can reduce distress and result in less tragic thoughts, less avoidance, and less fear, whereas suppression is a maladaptive strategy for people with anxiety disorders because it can increase arousal and distress (Gross, 2013). Habitual use of mindfulness techniques for individuals with anxiety disorders results in lower levels of anxiety (Campbell-Sills, Ellard, & Barlow, 2014). Practicing mindfulness can offer a much healthier method to relate to anxiety through self-awareness, as it increases a person's ability to maintain intentional focus. In addition, mindfulness may be able to change the brain. Studies have shown that focused attention and mindsets of acceptance can modify brain activity, such as cognition or emotion regulation (Cahn & Polich, 2006; Siegel, 2007; Wallace, 2006 as cited in Greeson & Brantley, 2009).

It is important to note the way the emotion regulation strategies of suppression and mindfulness impact memory. For example, it is often emphasized that suppression's effect on memory is a bad thing because it reduces memory, but one could imagine that forgetting negative events might be beneficial for the long-term regulation of anxiety. Suppression of emotions has a negative impact on anxiety levels, but could have a positive impact on memory for anxious events. Mindful awareness of emotions has a positive effect on anxiety

levels, but could have a negative impact on memory for anxious events. Therefore, it is very important to examine the impact of mindfulness and suppression on anxiety and memory levels.

The Current Study

The current study will examine what effect mindfulness has on anxiety and memory levels in comparison to a suppression and control group. In this within-subjects design, participants will undergo natural, suppression, and mindful conditions, while being shown a series of positive and negative images and rating how happy/unhappy (valence) they feel and how excited/calm (arousal), and then will be later tested on recall levels. I hypothesize that mindfulness will reduce anxiety levels and impair memory, and suppression will enhance anxiety levels and impair memory. Due to the fact that mindfulness and suppression are in the same emotion regulation group of "response modulation," they will both impair memory.

Method

Participants

The sample consisted of 30 undergraduate college students at Appalachian State University. The participants were between the ages of 18-33 (M=20.30, SD=2.89). Participants were recruited via the SONA system, and received two ELC's for their participation. This study received IRB approval on February 2, 2015. The approval and consent documents are in Appendices A and B.

Materials

Apparatus. E-prime professional 2.0 (Psychology Software Tools, Pittsburg, PA) was used to conduct the experimental procedure. The study also required a video camera to record the

participants facial expressions, which would be later rated to determine how well they were able to control their expression in the way that they were instructed.

Emotional Photographs. The study required 48 images of (24) anxiety-producing and (24) positive pictures from the International Affective Picture System (IAPS; Lang, Bradley, & Cuthbert, 2008) that were used to produce emotion in individuals. The photographs of anxiety-producing situations included items such as biological fears, threats of violence, and medical procedures. The mean arousal level for the anxiety-producing images was 6.00. The mean valence rating for the anxiety-producing images was 3.52. The positive photographs included items such as puppies or children playing. The mean arousal level for the positive images was 5.09 and the mean valence rating for the positive pictures was 7.41.

Self-Assessment Manikins. After viewing each picture, participants rated how they felt using a slightly modified version of the Self-Assessment Manikins for Valence and Arousal via a Likert scale ranging from 1-5 shown on the screen (Bradley & Lang, 1994). For the Valence rating, the participants would choose the figure labeled 1 if they felt completely happy while viewing the pictures, and the figure labeled 5 if they felt completely unhappy. For the Arousal rating, they would choose the figure labeled 1 if they felt completely stimulated while viewing the pictures, and the figure labeled 5 if they felt completely calm while viewing the pictures. Small figure drawings of people portrayed these sensations. They were also told that they could describe intermediate feelings by choosing any of the other numbers on the scale. Their selection was made via a button box in front of them.

Questionnaires. Several questionnaires were included to assess the characteristics of the sample and adherence to the mindfulness instructions.

Beck Anxiety Inventory. The Beck Anxiety Inventory was used to determine how anxious of an individual the participant has been as of the past month. On this 21-question self-report inventory, participants rated the degree that they felt various anxious symptoms on a Likert scale ranging from 0—3, 0 being "Not at all," and 3 being "severely—it bothered me a lot." Various symptoms of anxiety included items such as numbness or tingling, nervousness, feeling of choking, and being shaky/unsteady. Scores were interpreted by summing the total. Any score that was between 0-21 meant that the person had very low anxiety. A score ranging between 22-35 reveals moderate anxiety, and any score that is over 36 is a concerning score, and it may be a good idea to see a counselor or mental health specialist (Beck, 1988).

Five-Facet Mindfulness Questionnaire. The 5 Fact Mindfulness Questionnaire was used to determine how mindful of a person the participant is. Participants had to rate on a Likert scale from 1 to 5, 1 being "never or very rarely true", and 5 being "very often or always true", how much they agreed with the 39 questions. These questions included items such as "I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted," and "I pay attention to sensations, such as the wind in my hair or the sun on my face" (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). This questionnaire was scored by 5 different facets—observing, describing, acting with awareness, non-judging of inner experience, and non-reactivity to inner experience. Items in the describing, acting with awareness, and non-judging of inner experience were reverse-scored (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The average response to each set of items is reported in the analysis.

Toronto Mindfulness Scale. The Toronto Mindfulness Scale served as a manipulation check to determine how seriously the participants practiced mindfulness during the procedure. Questions were targeted to determine what the participants just experienced. Participants responded via a Likert Scale on a scale of 0-4, with 0 being "not at all," and 4 being "very much." Questions involved statements such as, "I was curious about what I might learn about myself by taking notice of how I react to certain thoughts, feelings, or sensations," and "I approached each experience by trying to accept it, no matter whether it was pleasant or unpleasant" (Lau, Bishop, Segal, Buis, Anderson, Carlson, Shapiro, & Carmondy, 2006). The questionnaire was divided into questions specifically targeting curiosity habits, and questions specifically targeting decentering habits. Those scores were summed to receive a total for each category (Lau, Bishop, Segal, Buis, Anderson, Carlson, Shapiro, & Carmondy, 2006).

Emotion Regulation Questionnaire. The Emotion Regulation Questionnaire was used to determine how often the participants regulate their emotions in their daily life. It assesses individual's use of two different strategies: cognitive reappraisal and expressive suppression. The questions are targeted towards participant's emotional experience and participant's emotional expression. Participants responded on a Likert scale ranging from 1 to 7, 1 being "strongly disagree," 4 being "neutral," and 7 being "strongly agree." Questions involved statements such as "When I want to feel more positive emotion (such as joy or amusement), I change what I'm thinking about," and "I control my emotions by not expressing them." Questions were scored via average scores on reappraisal items and suppression items (Gross & John, 2003).

Demographic Questionnaire. Participants also completed a demographic questionnaire, which asked questions such as age, ethnicity, semesters in college, any medical or psychological diagnoses, and treatment experiences.

Design

The independent variables of the study are the emotion regulation strategy (Control vs. Mindfulness vs. Suppression) and the valence of the pictures (Anxiety-Provoking vs. Pleasurable), and the primary dependent variable is the percentage of pictures recalled by the participant. I measured the dependent variable via a free recall test after the participant finished viewing the pictures. This design is a within subjects design, and participants underwent all 3 conditions: control, suppression, and mindful. Both the condition order and the assignment of pictures to conditions was randomly determined by the E-Prime program. Participants were shown 6 blocks of photos (3 instructions [neutral, suppress, mindful] x 2 valences [positive, negative] of 8 pictures each (based on Emery & Hess, 2011).

Procedure

Participants entered the experimental lab room individually. They were introduced to the study, and told that they could stop at any time if they felt uncomfortable. They were then given a consent form, which included information about the study as well as how the participant will be recorded via the video camera to rate facial expressions later on (see Appendix A). After they signed the consent form, the video camera was turned on. They began with a practice round with smiley faces to get them used to the procedure.

After finishing the practice round, participants then completed the Emotion Regulation Task on the E-Prime software in which they viewed positive and negative images from the International Affective Picture System under different sets of instructions. The

"Natural" and "Suppress" instructions were taken directly from Emery & Hess (2011). The "Mindful" instructions were taken from LaLot et al., 2014. The experimenter told the participant that before each group of pictures was shown, they would see a one-word instruction telling them what they should do while watching the pictures. The experimenter told the participants that when the word "Natural" appeared on the screen, they

"…should watch the next group of pictures as if you encountered them in your daily life, for example, as if you were watching them on television" (Emery & Hess, 2011).

For the word "Suppress", participants were told:

"Suppress means that while you are watching the pictures, you should do your best to not show any emotional expression on your face. In other words, you should conceal your emotions so that the person rating your expression cannot tell what you are feeling while viewing the images" (Emery & Hess, 2011).

For the word "mindful," participants were told:

"Mindful" means that while you are watching the pictures, you should pay attention to every reaction (sensations, thoughts, emotions) that may arise while watching, but at the same time, try to keep it distant. Observe that these reactions are nothing but momentary and temporary states of mind, which appear and disappear. Compare them to clouds in the sky: they move, loose their shape, and disappear. Consider your sensations, thoughts, and emotions the same way. Observe your reactions without trying to change, suppress, or avoid them" (Lalot, Delplanque, & Sander, 2014).

The experimenter then told them that after each group of pictures is presented, they will be asked to rate how happy or unhappy they feel, followed by how excited or calm they

feel, using the Self-Assessment Manikins described above. After the participants finished the task on the computer, the experimenter stopped recording on the video camera.

Next participants filled out the 5 questionnaires: The Beck Anxiety Inventory, the 5 Facet Mindfulness Questionnaire, the Toronto Mindfulness Scale, the Emotion Regulation Questionnaire, and a demographic questionnaire. After completing the questionnaires, the experimenter asked the participant to think back at the pictures they saw during the testing session, and asked them to recall any of the pictures they could remember, except for the smiley faces from the practice run. The experimenter asked them to take a few minutes to write down a short description of any of the pictures they can remember, including as much detail as possible in order to distinguish in particular which picture they are describing. Participants were given a recall sheet and a pen, and given any amount of time they needed to write down any images that they recalled from the experimental procedure. After they finished, participants were thanked and debriefed. The entire experimental procedure lasted about 45 minutes.

Results

Participant Characteristics

Participants in the study ranged between attending 0-12 semesters in college (M=3.03, SD=2.40). On the Emotion Regulation Questionnaire, for the reappraisal questions, participants scored between 3.67-6.83 (M=5.12, SD=.77). For the suppress questions, participants scored between 1.25-5.75 (M=3.71, SD=1.31). We can conclude from these statistics on the Emotion Regulation Questionnaire that participants more often reappraised their emotions rather than suppressed them. The Beck Anxiety Inventory revealed that people scored between 2.00-40.00 (M=16.37, SD=11.13) on their overall scores

of anxiety experienced within the past month. This reveals that the average number of people in the study experienced very low anxiety within the last month, but the range is extremely large. Based on the categories described in the method section, 19 participants had "low anxiety", 10 had "moderate anxiety", and 1 had "high anxiety." As seen in scores on the Five-Facet Mindfulness Questionnaire as seen in Table 1, participants on average scored the highest in the observing facet (*M*=3.49, SD=.63), and the lowest on the non-judgment scores (*M*=2.20, SD=.81).

Manipulation Check

The Toronto Mindfulness Scale served as a manipulation check for the "Mindful" instructions in the experiment. The questionnaire had questions specific to curiosity and decentering scores. The curiosity questions on average ranged between scores of 2.00-24.00 (*M*=2.38, SD=.98). This shows that there was moderate agreement in the participant's curiosity and participation in the mindfulness experiment, but a very large range of scores. The decentering scores ranged between 8.00-26.00 (*M*=2.27, SD=.59). In general, participants were active in participating in the mindfulness experiment, since the curiosity mean is a little higher than the decentering mean. The range is the sum of the scores, and the mean is the average scores.

Due to time constraints, we were not able to score the videos to determine how well participants were able to control their facial expression in the way that they were instructed, but we do have the data from the Toronto Mindfulness Scale which gives us a good picture of how involved participants were in their mindfulness ratings.

Picture Ratings

I next tested the hypothesis that mindfulness will reduce anxiety levels, and suppression will increase anxiety levels. Anxiety was operationalized in terms of arousal ratings and valence ratings given after each picture was viewed.

For arousal ratings, a 2 (Picture Valence: Negative vs. Positive) x 3 (Instruction: Mindful vs. Natural vs. Suppression) within-subjects design revealed a main effect of Picture Valence, $F(1,29)=76.33$, $p<.001$, $\eta^2_p=.73$, but no main effect of instruction, $F(2,58)=0.53$, $p=.59$, $\eta^2_p=.02$, and no Instruction x Valence interaction, $F(2,58)=0.53$, $p=.59$, $\eta^2_p=.02$. This suggests that it did not matter which condition the participants were in—the arousal levels were not significantly different. People did feel more aroused when viewing the negative pictures than the positive pictures. On average, the mindful negative ($M=3.03$, SD=.89) condition experienced more arousal than the mindful positive ($M=3.95$, SD=.69) condition, the natural negative ($M=3.02$, SD=.91) condition experienced more arousal than the natural positive ($M=3.77$, SD=.92) condition, and the suppress negative ($M=3.13$, SD=.97) condition experienced more arousal than the suppress positive ($M=3.88$, SD=.90) condition. Subsequent analyses do reveal that the higher the participants rated their anxiety on the Beck Anxiety Inventory, the higher they rated their arousal levels in response to the images.

For valence ratings, similar results were found. There was a main effect of picture valence, $F(1, 29)=142.01$, $p<.001$, $\eta^2_p=.83$, but no main effect of instruction, $F(2,58)=0.77$, $p=.47$, $\eta^2_p=.03$, and no picture valence x instruction interaction, $F(1,29)=1.75$, $p=.18$, $\eta^2_p=.06$, revealing that it did not matter which condition the participants were in—the valence levels were not significantly different. The pictures in the mindful negative (M=3.65, SD=.50) condition were rated more negatively than the mindful positive condition ($M=1.92$,

SD=.47), the natural negative (*M*=3.61, SD=.59) condition pictures were rated more negatively than the natural positive (*M*=2.03, SD=.63) condition, and the suppress negative (*M*=3.62, SD=.59) condition pictures were rated more negatively than the suppress positive (*M*=2.14, SD=.69) condition.

Picture Memory:

Next I tested the hypothesis that mindfulness and suppression will both impair memory. First, participants picture descriptions from the recall portion of the experiment were coded using the instructions from Emery & Hess (2011). The memories of the participants were copied directly from the paper into an Excel spreadsheet, and the recalled picture descriptions were then matched with the picture that most closely fit the description. If a participant misremembered a minor detail but the remainder of the details was accurate, then it was matched to that picture. Vague descriptions that could be applied to more than one picture were not used in analyses. If no picture matched with a description, the memory was not used in the research analyses. The dependent variable used in the analyses was the proportion of pictures recalled from each of the 6 conditions.

On average, participants produced 11.00 responses (SD=4.60), and 5.6% (SD=10.5%) of any one participants' responses were discarded. As may be seen by the large standard deviation, however, participants varied widely in how many of their responses were able to be coded. Typically, uncoded responses were too vague to be matched to a picture.

Results of the 2x3 within-subjects ANOVA revealed a main effect on valence on picture memory, $F(1,29)=18.32$, $p<.001$, $\eta^2_p=.39$, but no significant effects of instruction, $F(2,58)=1.16$, $p=.34$, $\eta^2_p=.04$, and no instruction x valence interaction, $F(2,58)=0.50$, $p=.61$, $\eta^2_p=.02$. This suggests that it did not matter what condition the participants were

in—the memory of the participants in each condition was not significantly different from each other. The significant effect of valence indicated that participants remembered the negative pictures better than the positive pictures. On average, the participants in the mindful negative (M=.33, SD=.20) condition recalled more pictures than the mindful positive (*M*=.27, SD=.23), the participants in the natural negative (*M*=.36, SD=.25) condition recalled more images than the natural positive (*M*=.24, SD=.17) condition, and the participants in the suppress negative (*M*=.33, SD=.22) condition recalled more images than the suppress positive (*M*=.19, SD=.18) condition.

It is interesting to note that although the condition x valence interaction was not significant, the differences between the positive and negative images recalled is slightly smaller in the mindful condition (.06) than in the suppression (.14) and natural conditions (.12). This shows that there is less variability of pictures recalled in the mindfulness condition.

In addition, exploratory analyses reveal that anxiety ratings on the Beck Anxiety Inventory have an effect on their performance on the emotion regulation task. Participants with moderate anxiety (*M*=.41, SD=.20) remembered more of the negative pictures while being mindful than those with low anxiety (*M*=.28, SD=.18). In contrast, participants with moderate anxiety (*M*=.32, SD=.20) had poorer memory recall for negative images in the suppress condition than participants with low anxiety (*M*=.33, SD=.24). This shows that when reported anxiety increased, memory for images while being mindful increased. When reported levels of anxiety increased, memory for images while suppressing emotions decreased.

Discussion

I hypothesized that mindfulness would reduce anxiety and impair memory, and suppression would increase anxiety and impair memory. This experiment analyzed what effect mindfulness and suppression would have on anxiety and memory levels. The results of this study revealed that arousal and valence levels did not show significant differences across instruction conditions. The results of this study also revealed that picture memory did not show significant differences across conditions. This means that there wasn't one instruction group where participants remembered more pictures than another group. Instead, negative pictures were rated more negatively and remembered more often than positive pictures. These results did not support my hypotheses, and also do not support previous research that mindfulness will lower anxiety ratings, and suppression will enhance anxiety ratings. The results of our study also do not support the finding that suppression will impair memory.

There were some limitations within the study that may explain the results showing such small effect sizes. The sample size is relatively small, and the population was biased with only college students. In addition, the participants were not given a set amount of time that they had to sit for recalling the pictures. Therefore, some participants sat for a long amount of time, writing lengthy descriptions and recalling as many pictures as they could, whereas other participants sat for less than one minute writing down a few memories and leaving quickly. Therefore, the individual motivation of the participant to finish the experiment may have been an explanation for these results. Another reason for the results showing as they did is the possible random order of the E-Prime software. The fact that some participants viewed the mindful condition first, while others viewed the suppression condition first, may have had an effect on their ability to fully engage their mindset in those

conditions after viewing another one first. Another reason for the results could have been that possibly our induction was not enough of an induction. It could be that just reading what it means to be mindful was not enough, and it may be possible that doing a deep breathing exercise beforehand could have increased participant's mindset towards a mindful perspective. It is also possible that explaining each condition would have shown better results if it was done right before each picture grouping, rather than explaining all 3 conditions all at once. It may have been more effective to explain the condition, and then show the group of pictures. Pausing between each group to read the instructions for that group would leave it more fresh in their mind and decrease likelihood of them forgetting.

In addition, it is possible that rating the valence and arousal levels after each picture group instead of after each individual picture could increase the effect sizes. The current study followed a similar protocol for showing the images as was done in Emery & Hess's (2011) study, where it was determined that suppression did reduce memory in younger adults. There were a few differences between the studies. In the current study, the pictures were more anxiety provoking, and in Emery & Hess's (2011) study, the images were more generally negative. Anxiety-producing images are very subjective, since what may be anxious for one individual may not be anxious for another, whereas negative images are more overall negative for all individuals. It may be easier to follow the directions and stay on task with the emotion regulation instruction when all the images are more similar, and contain less personal variability. In addition, in Emery & Hess's (2011) study, participants rated the arousal and valence of the images after the grouping of pictures, not after each individual picture as in the current study. Rating the overall feeling of a group of negative images as opposed to rating individual images that may be more or less anxious than others

could relate to why suppression was determined to reduce memory in younger adults in the previous study and not in the current study.

It was interesting to note that those with low anxiety in the mindful condition showed impaired memory for negative images in comparison to the suppression and control condition, and those with moderate anxiety in the mindful condition showed enhanced memory for negative images in comparison to the suppression and control condition. This shows the need for more of a mindful induction or more of a mindful training on participants. Those with moderate anxiety may not truly be adopting a mindful perspective, and those with low anxiety may already be more mindful than those with moderate anxiety. It was also interesting to note that those in the suppression condition showed impaired memory as their anxiety levels increased. This aligns with previous research that suppression impairs memory, but now in relation to anxiety. Lastly, it was also interesting to note that the small difference between the positive and negative images recalled in the mindful condition is slightly smaller than the difference between the images recalled in the suppression and natural conditions. Although not significant, with a larger sample size, this could continue to show the trend that those who adopt a mindful perspective are truly being less judgmental for positive and negative events, since their recall levels were the closest to equal between both positive and negative images.

My hypotheses were not proved correct, and therefore it would be interesting to rerun the study with more participants, while making the suggested modifications. The results of this study imply that further research needs to be done to replicate previous research as well as study the effect of mindfulness on memory in further depth.

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Table 1.

Average scores on the Five-Facet Mindfulness Questionnaire

Facet	*M*	*SD*
Observe	3.49	.63
Aware	2.95	.64
Describe	2.24	.54
Non-Judge	2.20	.81
Non-React	3.10	.55

Appendix A
Consent Form

Consent to Participate in Research
Information to Consider about this Research

Mindfulness and Suppression as Emotion Regulation Strategies.

Principal Investigator: Kaitlyn Pechanek
Department: Psychology
Contact Information:
PI Email: pechanekk@email.appstate.edu
Faculty Advisor: Lisa Emery
Faculty Advisor Email: emerylj@appstate.edu
Faculty Advisor Phone: 828-262-2272, ext. 416

What is the purpose of this research?

Include:

- By conducting this study, we are hoping to learn how changing your emotional experience impacts your thoughts and feelings.
- This study is being conducted for Kaitlyn Pechanek's honors thesis, and the summary results may be presented at a conference or in a publication.

Why am I being invited to take part in this research?

Include:

- You are invited to participate because you are at least 18 years old and are enrolled in a psychology course at Appalachian State University.
- If you volunteer to take part in this study, you will be one of about 30 people to do so.

What will I be asked to do?

- This study consists of one, 45-minute visit.
- You will be asked to view both happy and anxiety-producing photographs on a computer screen. The anxiety-provoking pictures are photos of biological fears (e.g., snakes, spiders, heights), threat of violence (guns, knives) or medical procedures (e.g., surgery). The happy photos are pictures of animals (e.g., puppies, kittens), social interactions (e.g., children playing, weddings, vacations) and food (e.g., sundaes, cakes).
- You will be asked to control your emotional feelings and expression in different ways while watching the photographs, and will be videotaped while you do this.
- You will also be asked to complete a memory test and some questionnaires about your mood and the ways you habitually control your emotions.

What are possible harms or discomforts that I might experience during the research?

- To the best of our knowledge, the risk of harm and discomfort from participating in this research study is no more than you would experience in everyday life. The photos you will view may produce some anxiety, but they are similar to images that you might see on television. If at any time you become uncomfortable, you may stop and still receive credit for participating.

What are possible benefits of this research?

- There may be no personal benefit from your participation but the information gained by doing this research may help others in the future.

Will I be paid for taking part in the research?

- You will not be paid for your participation in this study. However, you can earn 2 ELC credits for your participation. There are other research options and non-research options for obtaining extra credit or ELC's. One non-research option to receive 1 ELC is to read an article and write a 1-2 page paper summarizing the article and your reaction to the article. More information about this option can be found at: psych.appstate.edu/research. You may also wish to consult your professor to see if other non-research options are available.

How will you keep my private information confidential?

- Your information will be combined with information from other people taking part in the study. When we write up the study to share it with other researchers, we will write about the combined information.
- To ensure that your information is kept confidential, identification numbers but not names will be used on all documents and videos.
- The recorded videos will be kept on a password-protected computer in a locked laboratory, and will be available only to members of the research team. They will not be used in any publications or presentations.

Whom can I contact if I have a question?

If you have questions about your rights as someone taking part in research, contact the Appalachian Institutional Review Board Administrator at 828-262-2692 (days), through email at irb@appstate.edu or at Appalachian State University, Office of Research Protections, IRB Administrator, Boone, NC 28608.

Do I have to participate?

Your participation in this research is completely voluntary. If you choose not to volunteer, there is no penalty or consequence. If you decide to take part in the study you can still decide at any time that you no longer want to participate. You will not lose any benefits or rights you would normally have if you do not participate in the study.

This research project has been approved on February 2, 2015 by the Institutional Review Board (IRB) at Appalachian State University. This approval will expire on February 1, 2016 unless the IRB renews the approval of this research.

I have decided I want to take part in this research. What should I do now?

If you have read this form, had the opportunity to ask questions about the research and received satisfactory answers, and want to participate, then sign the consent form and keep a copy for your records.

_____ _____

Participant's Name (PRINT) Signature Date

I am aware that I will be videotaped and I release the recordings to the research team for data analysis purposes only. Participant's Initial _____ Date _____

Appendix B
IRB Approval

To: Kaitlyn Pechanek

EMAIL

From: Dr. Lisa Curtin, Institutional Review Board Chairperson
Date: 2/02/2015
RE: Notice of IRB Approval by Expedited Review (under 45 CFR 46.110)
Study #: 15-0195

Study Title: Mindfulness and Suppression as Emotion Regulation Strategies
Submission Type: Initial
Expedited Category: (6) Collection of Data from Recordings made for Research Purposes,(7) Research on Group Characteristics or Behavior, or Surveys, Interviews, etc.
Approval Date: 2/02/2015
Expiration Date of Approval: 2/01/2016

The Institutional Review Board (IRB) approved this study for the period indicated above. The IRB found that the research procedures meet the expedited category cited above. IRB approval is limited to the activities described in the IRB approved materials, and extends to the performance of the described activities in the sites identified in the IRB application. In accordance with this approval, IRB findings and approval conditions for the conduct of this research are listed below.

Regulatory and other findings:

The IRB determined that this study involves minimal risk to participants.

Approval Conditions:

Appalachian State University Policies: All individuals engaged in research with human participants are responsible for compliance with the University policies and procedures, and IRB determinations.

Principal Investigator Responsibilities: The PI should review the IRB's list of PI responsibilities. The Principal Investigator (PI), or Faculty Advisor if the PI is a student, is ultimately responsible for ensuring the protection of research participants; conducting sound ethical research that complies with federal regulations, University policy and procedures; and maintaining study records.

Modifications and Addendums: IRB approval must be sought and obtained for any proposed modification or addendum (e.g., a change in procedure, personnel, study location, study instruments) to the IRB approved protocol, and informed consent

form before changes may be implemented, unless changes are necessary to eliminate apparent immediate hazards to participants. Changes to eliminate apparent immediate hazards must be reported promptly to the IRB.

Approval Expiration and Continuing Review: The PI is responsible for requesting continuing review in a timely manner and receiving continuing approval for the duration of the research with human participants. Lapses in approval should be avoided to protect the welfare of enrolled participants. If approval expires, all research activities with human participants must cease.

Prompt Reporting of Events: Unanticipated Problems involving risks to participants or others; serious or continuing noncompliance with IRB requirements and determinations; and suspension or termination of IRB approval by an external entity, must be promptly reported to the IRB.

Closing a study: When research procedures with human subjects are completed, please complete the Request for Closure of IRB review form and send it to irb@appstate.edu.

Websites:

1. PI responsibilities: http://researchprotections.appstate.edu/sites/researchprotections.appstate.edu/files/PI%20Responsibilities.pdf

2. IRB forms: http://researchprotections.appstate.edu/human-subjects/irb-forms

CC:
Lisa Emery, Psychology

Appendix C

IAPS pictures used in the study

Anxiety-Producing Images:
1112
6250.1
8160
1201
8179
9592
2120
2682
2683
8191
3022
9050
9908
9921
1050
2055.1
3230
6312
6211
1932
3211
2691
6300
9582

Positive Images:
1710
2045
2208
2216
2091
2345
4614
5199
2635
7330
4626
7052
8350
2550
2165
2340
8470
7440
2311
2224
4622
4603
8420
8540